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PSYCHE

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A NEW EURYTHRIPS (THYSANOPTERA) FROM TRINIDAD

By J. Douglas Hood

University of Rochester, Rochester, N. Y.

Through the kindness of Dr. C. P. Alexander, it has been possible to study a paratype of *Eurythrips ampliventralis* Hinds from the collection of the Massachusetts State College. This has resulted in the differentiation of the new species described below.

Eurythrips amplus sp. nov.

Female (macropterous).—Length about 1.5 mm. (distended, 1.9 mm.) Color brown, darkest in vertex and along sides of head and pterothorax and in distal portion of abdomen, paler in abdominal segments I-IV, in proximal angles of V-VII, in proximal fourth and distal two-fifths of tube, and in legs (particularly at ends of tibiæ and in tarsi, these being yellow); antennæ dark brown, with base of segment I, apex and middle portion of II, and pedicel of III nearly or quite yellow, IV-VII darkest basally, III paler apically; wings of fore pair pale brownish and darker at base; ocellar pigmentation red.

Head (Pl. 1, fig. 3) fully 1.42 times as long as greatest width, which is at proximal third of cheeks, the latter nearly evenly but decidedly rounded to eyes and very slightly converging in basal third, with a somewhat wider and indistinct basal collar, serrate as seen from above because of

short anastomosing lines which do not extend onto dorsum of head excepting faintly at extreme base[1], and with a slight tooth behind eyes; head sharply constricted at posterior margin of eyes, at this point narrowest and about 0.8 the least subbasal width, the width across eyes nearly equal to greatest width; vertex slightly elevated, subconical, distinctly produced and overhanging, bearing the anterior ocellus at its extremity, distinctly subreticulate, and with two pairs of small setæ, one of them behind the posterior ocelli, the other on sides of vertex and very slightly in advance of front margin of posterior ocelli; cheeks with about four pairs of similar small setæ in addition to a pair behind and between postocular setæ; postoculars nearly clear, expanded at tip, 83u long and 90u apart. *Eyes* strongly protruding, composed of relatively few large convex facets, about 0.3 as long as head, their width greater than 0.9 their interval and about three-fourths their length. *Ocelli* present, the posterior ones about 17u in diameter and about 0.6 as wide as their interval, the *median ocellus with posterior margin far* (12*u*) *in advance of anterior margin of eyes.* Antennæ (Pl. 1, fig. 4) about 2.16 times as long as head, *segments VI-VIII rather compactly united because of the very short and broad pedicels of VII and VIII, which are retracted into the apices of the preceding segments, VII with pedicel about* 15*u wide and very nearly twice as broad as that of VI, VIII with pedicel* 13*u wide;* sense-cones slender, the number on inner (and outer) surface of segments as follows: III 1(2), IV 1(2), V 1(1+1), VI 1(1+1), VII with the usual one on dorsum near apex; setæ long, slender, pale and pointed. *Mouth-cone* broadly rounded at tip, supasssing middle of prosternum.

Prothorax (Pl. 1, fig. 3) along median line of pronotum about two-thirds as long as head and (inclusive of coxæ) about twice as wide as long, with a short vestigial median thickening, with a few faint lines of sculpture along posterior margin, and fused with posterior half of epimera; anterior marginal setæ minute, the others nearly colorless,

[1]In order to show these at all in the figure, it has been necessary to represent them more conspicuously than they show in the specimen.

long, and dilated at tip, the anterior laterals 80u, midlaterals 78u, epimerals 79u, posterior marginals 87u, coxals 50u. Pterothorax distinctly wider than prothorax, notal plates nearly smooth. *Legs* normal; fore tarsus with a slight downwardly-directed tooth or claw at inner distal angle of first segment. *Wings* normal, the fore pair (Pl. 1, fig. 2) without accessory setæ and with the three subbasal setæ long, knobbed, pale, and comparable with those on anterior angles of pronotum.

Abdomen about 1.4 times as wide as prothorax across coxæ, free of sculpture save for the usual dark transverse line near bases of terga II-IX, major setæ mostly knobbed, the lateral pair on VII about 113u and pointed, its homologue on VIII about 97u and knobbed, that on IX about 123u and nearly pointed; tube (Pl. 1, fig. 1) about two-thirds as long as head and *only* 1.57 *times as long as greatest subbasal width,* this twice the apical width, sides very slightly concave in distal five-sixths, its terminal setæ pale and nearly 0.9 its length.

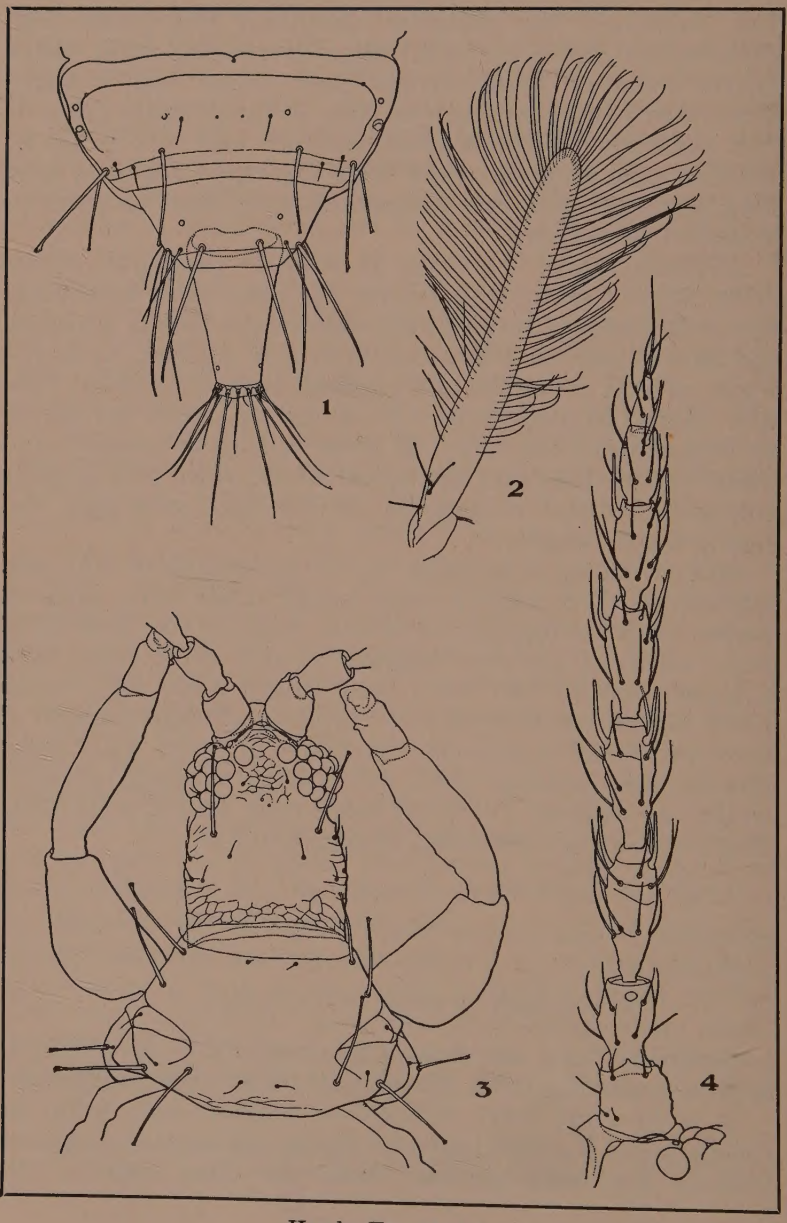
Measurements of holotype (♀): Length about 1.51 mm. (distended, 1.89 mm.); head, length 0.205 mm., greatest width (at basal fourth) 0.144 mm., width across eyes 0.139 mm., width at posterior margin of eyes 0.111 mm., least subbasal width 0.140 mm.; eyes, length 0.060 mm., width 0.045 mm., interval 0.048 mm.; prothorax, median length of pronotum 0.137 mm., width (inclusive of coxæ) 0.277 mm.; pterothorax, greatest width 0.331 mm.; abdomen, greatest width (at segment IV) 0.388 mm.; tube, length 0.132 mm., width near base 0.084 mm., at apex 0.041 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (u):	50	53	70	66	60	59	49	37
Width (u):	42	32	30	29	27	26	22	13

Total length of antenna 0.444 mm.

Described from one female taken by Dr. C. B. Williams at St. Joseph, Trinidad, March 4, 1918, by sweeping grass.

It is in some ways difficult to compare this with the closely allied *E. ampliventralis* Hinds, because one is known only in the macropterous form, the other only in the



Hood—Eurythrips

brachypterous. One important difference, not correlated with wing development, is the peculiar structure of the pedicels of the last two antennal segments. In *amplus* these are very short, widened basally, and that of the penultimate segment is nearly twice as wide as that of the sixth. Other differences lie in the much larger size of *amplus*, in the longer and proportionately slenderer antennal segments, and in the much stouter tube. In *ampliventralis* this last is about 143 microns long and 79 microns wide near base, and the proportion of length to breadth is thus 1.81, as against 1.57 in *amplus*.

EXPLANATION OF PLATE 1.

(Drawn by Miss Helen E. Rearwin; camera lucida.)

Eurythrips amplus sp. nov.

Fig. 1.—Abdominal segments VIII-X, ♀, holotype.

Fig. 2.—Right fore wing, ♀, holotype.

Fig. 3.—Head and prothorax, ♀, holotype; all setæ omitted from appendages.

Fig. 4.—Right antenna, ♀, holotype.

NEW FORMS OF APHÆNOGASTER TREATÆ FOREL FROM THE SOUTHERN UNITED STATES (HYM.: FORMICIDÆ)

By George C. and Esther W. Wheeler
University of North Dakota

In describing new forms of *Aphænogaster treatæ* Forel, we have found the original specific description (1886) too brief. It seems desirable, therefore, to give here a few additional characteristics which we have found useful in comparisons.

Worker. Length of head exclusive of mandibles 1½ times its greatest width. Scape 1⅕ times the length of the head; lobe ¼ to ⅓ the length of the scape. The long flange bordering the lobe posteriorly[1] is low and the anterior surface of the lobe is convex except that the distal portion has a small concavity between the posterior and anterior flanges. The short anterior flange arising at an acute angle from the posterior one disappears into the anterior convexity. (See Fig. 1a and b.) The base of the epinotum is twice the declivity.

Head coarsely and longitudinally rugoso-reticulate with surface between the reticulations finely punctate. Frontal area with a median longitudinal ridge. Transverse striations on the dorsal surface of the epinotum commence at the base and merge into reticulations or indistinct striations in the region between the spines. Posterior surfaces of nodes densely and irregularly punctate. Mandibles hairy.

Thorax dark ferrugineous; head and abdomen above fusco-ferrugineous.

We have been unable to procure a female of *A. treatæ*.

[1]In this paper the anterior part of the lobe is that surface which faces forward when the scape is appressed to its groove in the head; the posterior, the area concealed thus.

MALE. Epinotum ⅓ the entire thorax, slightly longer than mesonotum. Spines usually reduced to blunt protuberances.[2] Base 3 times the declivity.

Head densely punctate. Mesoscutum smooth and irregularly pitted laterally, finely punctate above, coarser behind; scutellum punctate, mesopleuræ smooth, striated near anterior border. Anterior half of base of epinotum smooth, posterior half of its base punctate; its declivity irregularly cross-striated. Nodes faintly punctate, postpetiole with a narrow band of lateral longitudinal striations.

Abdomen shining and smooth except the posterior halves of petiole and postpetiole, which are rugosely and finely reticulate. A few hairs on the head, almost none on the thorax; scattered longer hairs on the abdomen.

Dark fuscous; legs and tip of abdomen, fusco-testaceous. Mandibles, anterior edge of pronotum, tarsi, and genitalia, testaceous.

This supplementary description of the male is taken from a specimen sent us by Dr. W. S. Creighton, collected at Lookout Mt., Fort Payne, Ala., and considered by him to be typical.

Aphænogaster treatæ subsp. **pluteicornis,** new subspecies

WORKER. Length 6 mm.

Differs from the typical *treatæ* in the following details: Scape usually 1⅕ the length of the head exclusive of the mandibles. Antennal lobe is about ¼ the length of

[2]The epinotal spines of the males of *A. treatæ* are probably variable likewise, although Forel (1886) says "armé de deux épines." In the type nest of *A. pluteicornis* the spines are vestigial, being represented by low rounded protuberances. Sometimes these resemble spines broken off near the base. However, small hairs have been found on the apparently broken end, and also, an adult male was discovered still inside the untorn pupal exuvium with this same rounded projection. These facts nullify the possibility of the stumps being broken spines. Another nest of this same subspecies, collected at Ivanhoe, Texas, has long slender spines on all males. Emery (1895) in speaking of *A. treatæ* males reports: "Unter den mir vorliegenden ♂ ♂ aus D. Columbia finde ich nur eins mit langen und an der Spitze stumpfen Dornen; bei allen andern, darunter 2 aus demselben Fläschen wie das bedornte Exemplar sind mir stumpfe Beulen zu sehen. Ein leider sehr beschädigtes Originalexemplar des ♂ aus N. Jersey hat kurze, stumpfe Dörnchen."

the scape. The flange bordering it posteriorly is higher and the anterior surface of the lobe next to this flange is very concave. (See Fig. 1c & 1d.) Spines on the epinotum a little longer, varying from ⅓ to ½ the base.

Hairs even more sparse; short and coarse on head, prosternum, dorsa of thorax and petiole; finer on abdomen. A few scattered, very small hairs, suggestive of rudimentary pubescence, on the gastric dorsum in addition to the usual longer hairs.

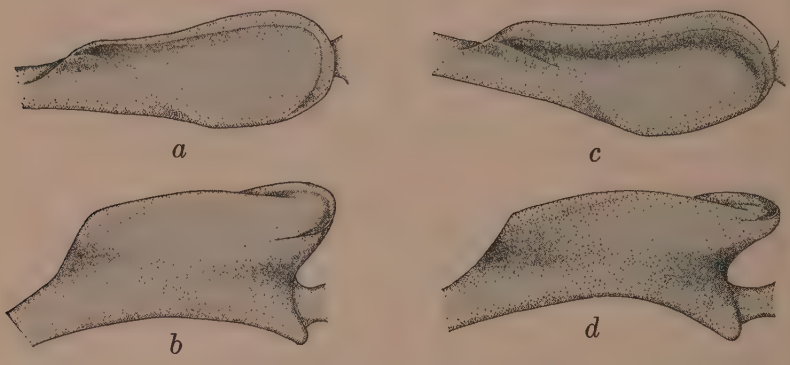


Fig. 1. *a*, left antennal lobe of *Aphænogaster treatæ*, anterior view; *b*, lateral view of same; *c*, left antennal lobe of *Aphænogaster pluteicornis*, var. *oklahomensis*, anterior view; *d*, lateral view of same.

Head not so coarsely rugoso-reticulate. The feeble transverse striations on the dorsum of the epinotum are almost immediately indistinguishable from reticulations. Petiole and postpetiole more faintly punctate laterally and less rugose above. Very fine reticulations of the first gastric segment extend indistinctly to the posterior edge.

Ferrugineous throughout except the abdomen which varies from ferrugino-fuscous to ferrugino-testaceous with a tendency to be lighter at the apex.

Female. Length 8 mm.

Differs from the worker in having the lobe a trifle longer in proportion to the scape. Length of head exclusive of

mandibles 1⅕ times the width. Scape shorter, 1 1-15 times the length of the head.

Sculpture coarser, gaster duller. Mesoscutum striated above longitudinally; on the mesoscutellum these ridges curve into cross striations posteriorly. Transverse striations of epinotum regular, not reticulate. Petiole rugose, reticulations becoming somewhat diagonally striated behind. Area between the reticulations punctate. Keel on the ventral surface sharp. Anterior dorsum of postpetiole reticulate, somewhat coarser and transversely striated behind. First gastric segment finely striated longitudinally at the base, merging into fine reticulations and fading out posteriorly.

Hairs relatively shorter and more abundant.

Color ferrugineous to fusco-ferrugineous, lighter specimens with darker parapsidal furrows. Metanotum, teeth of mandibles, area between ocelli, margins of thoracic sclerites, bands on the apices of gastric segments, fusco-ferrugineous; when completely retracted the lighter bands are concealed.

MALE. Length 5 mm.

Differs from the male of *A. treatæ* as follows:

Irregularly transverse ridges of the epinotal declivity fewer. Epinotal spines variable,[2] sometimes reduced to low rounded protuberances. Thorax piceous, femora and tibiae darker also.

These ants were collected by the authors in open woods (mostly *Quercus marilandica* Muench.), where the soil was a sandy loam.

Oklahoma: Poteau. VI-17-'29. Numerous workers, 1 deälated female, 3 winged females, 4 males, and a few larvæ and pupæ. On a steep slope in the soil and under dead leaves beside a stone. (Type nest.)

Oklahoma: Poteau. VII-16-'22. Small colony under a stone on a steep hillside.

Texas: Ivanhoe (Fannin County). VI-27-'29. Numerous workers, 8 deälated females; 7 winged females, 3 males, a few larvæ and pupæ. In the buried end of a small decayed branch.

Aphænogaster treatæ pluteicornis var. **oklahomensis,** new variety

WORKER. Length 5½-6 mm.

Differs from *A. treatæ pluteicornis* in the following respects: Scape 1⅕ to 1¼ the length of the head exclusive of the mandibles. Lobe ¼ the length of the antennæ and more concave next to the posterior flange, which is higher. (See Fig. 1c & 1d.) Epinotal spines about ½ the base, but variable. Epinotum more definitely striated. The first dorsal segment of the gaster more faintly reticulate. Posterior surface of the node of the postpetiole less densely punctate above. Fulvous, with head more ferrugineous, teeth of mandibles fuscous, and gaster light fulvo-fuscous.

FEMALE. Length 8 mm.

Differs from the female of *A. pluteicornis* in these characteristics: Antennæ shorter, scape 1 1/11 times the length of the head. Lobe ⅓ the scape. Posterior dorsum of the petiole more roughly reticulate, forming indefinite cross-striations. Postpetiole more rugose with a tendency to cross-striations. Fusco-ferrugineous, darker than most females of *A. pluteicornis*.

Oklahoma: Poteau, VII-16-'22. Numerous workers, 1 deälated female and a few larvæ and pupæ. Nest under a stone in the same environment as *A. pluteicornis*.

Aphænogaster treatæ pluteicornis var. **alabamensis,** new variety

WORKER. Length 5-6 mm.

Differs from *A. pluteicornis* in the following manner:

About half the workers have the scape of 1⅓ times the length of the head, the rest vary to 1¼. The anterior surface of the antennal lobe is usually convex with only a small shallow concavity near the low flange; in a few specimens it is deeper. The base of the epinotum varies from 2 to 2½ times the declivity.

The head is more coarsely reticulate. Posterior surface of the node of the postpetiole finely punctate. Sparse gastric pubescence entirely absent.

Color ferrugineous like *A. pluteicornis* or varying to ferrugino-testaceous.

FEMALE. Length 8 mm.

Like *A. pluteicornis* but with these few minor differences: Flange of the lobe a little higher; scape 1 1-11 the length of the head; color similar except that the frontal area is darker.

Alabama: Lookout Mt., Fort Payne, 12-VII-'29. Collected by Dr. W. S. Creighton.

Compared with *A. treatæ*, the head of the worker is not so coarsely reticulate, but the antennal lobe is similar except that the anterior flange is longer; the transverse striations of the epinotum usually merge sooner into reticulations which disappear between the spines, but a few specimens approach nearer *A. treatæ* in rugosity; the hairs are fewer and the color is always lighter.

This variety exhibits more variability within the nest than do our other forms of *A. treatæ*. The sculpture of the worker including the striations of the epinotum, and the shape of the antennal lobe are intermediate between *A. pluteicornis* and *A. treatæ*.

KEY TO THE FORMS OF APHAENOGASTER TREATAE

1. Lobe at the base of the antenna short, 1/5 or 1-6 the length of the scape[3] ..... 2.
   Lobe longer, 1/3 to 1/4 the length of the scape ..... 3.
2. Lobe narrow and very short, 1-6 the scape. Ferrugineous, head and abdomen slightly darker ..... *treatæ* subsp. *harnedi* W. M. Wheeler (1919).
   Lobe 1/5 the scape. Dark fuscous to piceous ..... *treatæ* var. *ashmeadi* Emery (1895)[4].
3. Lobe broadly angulate in front. Dark fuscous to piceous. *treatæ* subsp. *wheeleri* Mann (1915).
   Lobe not broadly angulate but evenly rounded ..... 4.

[3]The lobe is measured from the point where the scape begins swelling to the tip of the anterior surface, nearest the antennal insertion.

[4]Mayr (1886) first mentioned this variety but failed to name it.

4. Dark ferrugineous, head and abdomen ferrugino-fuscous above. Transverse epinotal striations extend to the spines ..... *treatæ* Forel (1886).
   Color lighter. Striations of epinotum not so extensive. Sculpture less rugose. Punctation on first gastric segment finer ..... 5.

5. Dorsum of epinotum usually reticulate, not striate. Ferrugineous, abdomen varying to ferrugino-testaceous..... *treatæ* subsp. *pluteicornis*, new subsp.
   Transverse striations present on base of epinotum..... 6.

6. Less hairy. Concavity of antennal lobe deep and flange high. Striations of epinotum very faint. Thorax light fulvous, head ferrugineous, gaster light fulvo-fuscous..... *treatæ pluteicornis* var. *oklahomensis*, new variety.
   More hairy. Concavity of antennal lobe small and flange lower. Striations of epinotum definite. Apex of postpetiole more reticulate. Coarseness of sculpture intermediate between *A. treatæ* and *A. pluteicornis*. Ferrugineous to ferrugino-testaceous ..... *treatæ pluteicornis* var. *alabamensis*, new variety.

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ON THE TICKS OF CUBA, WITH DESCRIPTION OF A NEW SPECIES, *AMBLYOMMA TORREI*, FROM *CYCLURA MACLEAYI* GRAY.[1]

By J. Pérez Vigueras

School of Veterinary Medicine, University of Havana.

In the literature on Ixodoidea I find the following information relating to species recorded from Cuba.

F. J. Balmaseda (Enfermedades de las aves ó Ensayo sobre Patornitología y consideraciones sobre Higiene Pública en la Isla de Cuba. Havana, 1889) cites two species: *"Ixodes reticulatus"* (pp. 272 and 275) on cattle, and *"Ixodes ricinus"* (p. 272) on dogs.

G. Neumann (Mém. Soc. Zool. France) records *Rhipicephalus annulatus* (1897, p. 412); *R. bursa* (1897, p. 393); *Amblyomma cajennense* (1899, p. 208); *A. tuberculatum* (1899, p. 236); *A. albopictum* (1899, p. 244); *Rhipicephalus annulatus,* typical (1901, p. 279); and *R. annulatus* var. *microplus* (1901, p. 280).

C. W. Stiles and A. Hassall (U. S. Dept. Agric., Bur. Anim. Ind., Circ. No. 34, 1901, p. 3) cite *Boophilus australis* as present in Cuba.

Nuttall, Warburton, Cooper and Robinson (A Monograph of the Ixodoidea, 1908-1926) repeat in part the records given by Neumann.

A publication issued by the Secret. Agric. Com. y Trab., Habana, (Circ. No. 57, 1919, p. 7) states that *"Boophilus annulatus* or *Margaropus annulatus"* is the most common species.

N. S. Mayo (First Annual Rept. Agric. Exp. Sta. Cuba, 1906, p. 44) lists from Cuba *Dermacentor nitens, Margaropus annulatus,* and *M. annulatus australis;* and later (Second Rept. Agric. Exp. Sta. Cuba, 1909, p. 27), he also mentions *Rhipicephalus texanus* as a Cuban species on dog.

[1]Translated, from the original Spanish MS, by J. Bequaert.

W. A. Hooker (Jl. Econ. Entom., II, 1909, p. 415) gives a list of the ticks known at the time from Cuba. He repeats most of the previous records and includes the following species of which he saw Cuban specimens in the collection of the U. S. Bureau of Entomology: *Amblyomma albopictum, Argas miniatus, Margaropus annulatus, Ornithodoros marginatus* (Banks, MS. name).

In 1910 (Proc. Ent. Soc. Washington, XII, p. 6), N. Banks describes *Ornithodoros marginatus,* from a cave in the Guanajay Mountains, Cuba (collected by Palmer and Riley), and also from a West Indian bat (collected by Barrett, probably in Porto Rico).

The foregoing data might call for some discussion, but I prefer to give the following brief summary.

1. *"Ixodes reticulatus"=Dermacentor reticulatus* (Fabr., 1794). It is evident that Balmaseda used this name for the ticks he found on cattle, because *"Ixodes reticulatus"* is the best known tick name. The presence of this species in Cuba could only be explained as accidental, through introduction with cattle from Europe. Given this possibility and in view of its origin, this species should be struck out from the Cuban list.

2. *"Ixodes ricinus"=Ixodes ricinus* (Lin., 1758). Up to the present the occurrence of this tick in the island has not yet been positively established. It seems certain that Balmaseda cited it only because he was familiar with the name.

I mention the foregoing two species only because they have appeared in print.

3. *Amblyomma albopictum* Neumann, 1899. The occurrence of this tick in Cuba has been confirmed.

4. *Amblyomma cajennense* (Fabricius, 1787). This species is very common in Cuba.

5. *Amblyomma tuberculatum* Marx, 1894. This tick was collected by Gundlach and identified by Neumann. Dr. Bequaert is of the opinion that Gundlach obtained his specimens off gopher turtles brought to Cuba from the United States, where the species is indigenous. In view of this, this tick must be eliminated from the Cuban list.

6. *Rhipicephalus annulatus, R. annulatus* var. *microplus,* and *Boophilus australis* all refer to *Boophilus microplus* (Canestrini 1888), in so far as the species of Cuba is concerned.

7. *"Margaropus annulatus* or *Boophilus annulatus."* I have searched for this tick with special care, examining lots coming from many different parts of the island, but I have never seen it. If it occurs on cattle imported from the United States, it must be very rare.

8. *Dermacentor nitens* Neumann, 1897. The occurrence of this tick in Cuba is certain.

9. *Argas miniatus* Koch, 1844. This name is now regarded as a synonym of *Argas persicus* (Oken, 1818), which is well known as a Cuban tick.

10. *Ornithodoros marginatus* N. Banks, 1910. Dr. Bequaert, who saw cotypes in Mr. Banks' collection at the Museum of Comparative Zoölogy, Cambridge, Mass., informs me that it is an extremely remarkable species. As Mr. Banks states, it is "readily known from all other species by the row of tufted humps on margins of body." It probably is peculiar to West Indian caves, where it doubtless feeds on bats.

11. *Rhipicephalus bursa* Canestrini and Fanzago, 1877. This is mainly a tick of the Old World, where it is found on cattle, horses and other hosts. It is rather similar to *R. sanguineus,* and it is possible that the specimens seen by Neumann from Cuba were that species and not the true *R. bursa.* In any case, the record needs confirmation and I do not therefore include the species in my list. It should be noted that Neumann did not mention *R. sanguineus* from Cuba.

12. *Rhipicephalus texanus* N. Banks, 1908. The correct identity of this species is open to question. The Cuban specimens which Mayo referred to it, were, however, beyond doubt *R. sanguineus,* the common dog-tick of the island.

I shall now give a list of the species of ticks at present positively known to occur in Cuba, with the hosts on which they may be found, as well as the localities.

IXODOIDEA Banks, 1894

I. *Argantidæ* Agassiz, 1846

G. **Argas** Latreille, 1796

1. *A. persicus* (Oken, 1818) Fischer, 1827.—Host: *Gallus gallus*. Localities: Provinces of Havana, Matanzas, and Santa Clara. This species has been known in the island for many years. The country-people call it and its larvae "*garrapatillas*." As in other countries, it has been shown rather frequently in Cuba that this parasite transmits spirochetosis of poultry.

G. **Ornithodoros** Koch, 1844

2. *O. megnini* (Dugès, 1883) Neumann, 1896. Host: *Equus caballus*. Locality: Province Havana. It does not appear to be common. I have only encountered it once, on a native horse, and I cannot assure that it is actually indigenous. If it is shown later not to be indigenous, it should be struck out from the list.

3. *O. marginatus* Banks, 1910. Locality: Guanajay Mountains, Prov. Pinar del Rio. It is restricted to bats. Two larvae, possibly of this species, were taken by Mr. P. Bermudez off a bat, *Eumops glaucinus* (Wagner), at Caibarien, Prov. Santa Clara.

II. *Ixodidæ* Murray, 1877

G. **Dermacentor** Koch, 1844

4. *D. nitens* Neumann, 1897.—Hosts: *Equus caballus, Bos taurus,* and also *Epicrates angulifer* Bibron. Localities: Provinces of Havana, Pinar del Rio, Santa Clara, Matanzas, and Camaguey. This tick was first recorded from Cuba by N. S. Mayo (1906). It is widely distributed over the entire island. I have found it parasitizing indiscriminately equines and bovines, but more particularly the former, in the ears, in the region of the anus and perineum. I have found it also once on a "Majá de Santa María" (*Epicrates angulifer*) captured at Calabazar de Sagua (Prov. Santa Clara).

G. **Rhipicephalus** Koch, 1844

5. *R. sanguineus* (Latr., 1806) Koch, 1844.—Host: *Canis familiaris*. Localities: Provinces of Havana, Ma-

tanzas, and Santa Clara. This is the common dog-tick of Cuba, widely distributed, probably, over the entire island. I have not seen it outside the provinces mentioned.

G. **Boophilus** Curtice, 1891

6. *B. microplus* (Canestrini, 1888). Hosts: *Bos taurus, Equus caballus.* Localities: Provinces of Havana, Matanzas, Pinar del Rio, Santa Clara, and Camaguey. This species has been recorded by various investigators (Neumann, Stiles, Bequaert). It is the common tick of our cattle. I have taken specimens from deer ("venado"), *Odocoileus virginianus,* at Artemisa, Prov. Pinar del Rio.

G. **Amblyomma** Koch, 1844

7. *A. cajennense* (Fabr., 1787) Koch, 1844. Hosts: *Equus caballus, Bos taurus.* Localities: Provinces of Havana, Pinar del Rio, and Santa Clara. This, as well as *Boophilus microplus* and *Dermacentor nitens,* are our most common ticks, which parasitize cattle.

8. *A. albopictum* Neumann, 1899. Host: *Cyclura macleayi* Gray. Locality: Province of Havana. The species was first described by H. Lucas (1852; as *Ixodes variegatus*), from specimens collected near Havana by Gundlach. The present author has also found it.

9. *Amblyomma* species? (near *scutatum* Neumann, 1899). Hosts: *Bufo peltacephalus* Tschudi (vernacular name: "sapo"), *Cyclura macleayi* Gray. Localities: Provinces of Havana (Laguna de Ariguanabo) and Oriente (San German; collected by M. Jaume). The true identity of this tick is as yet undecided. According to Dr. Bequaert, it is quite different from *A. dissimile* Koch, and possibly represents an undescribed species.

10. *A. torrei,* new species. Host: *Cyclura macleayi* Gray (*carinata* of authors; vernacular name *"iguana"*).

Locality: Province of Havana.

Description: *Amblyomma.*

Male: Length, 3.2 mm.; greatest width, 3 mm. Body slightly oval, without marginal groove; cervical groove short and deep; eyes of median size, not orbited, quite apparent; scutum convex, ornate; eleven quadrangular festoons; five ventral plates; dentition 3:3.

Scutum convex; color pale chestnut, with two large and continuous pale spots, placed symmetrically on each side; each spot occupying about one-third of the total length, and extending without interruption from the outer half of the scapular angles to the first two festoons. The pale chestnut fringe extends without interruption from the internal half of the scapular angle to the festoons 3-7, narrowing in its posterior two-thirds like a belt, and continuing without interruption, but with a very irregular inner border, along the margin to the eye. In the pale areas there is a narrow green band, which in the center is of a pale porcelanous violet color and toward the outside with a yellowish tinge and small green spots. Festoons as wide as long. Dorsum with fine, uniformly distributed punctures. Venter glabrous; genital orifice slightly anterior to coxa II; anus one-third of the total length from the hind margin. Stigmal plate subtriangular, with rounded angles. Five ventral plates, nearly circular, placed approximately opposite the festoons 2, 4, 6, 8, and 10. Coxa I with one triangular, median spur and another short spur, a little projecting from a broad base. Coxa II with a triangular spur, but smaller than that of coxa I. Coxa III with a spur similar to that of coxa II, and a slightly marked projection on its base. Coxa IV with a spur similar to that of coxa III, and a projection or raised portion, slightly marked at the base. Tarsi gradually attenuated. Capitulum 1.2 mm. long; basis capituli 0.56 mm. long and 0.76 mm. wide. Palpi 0.8 mm. long; segment I short; segment II, 0.32 mm. long; segment III, 0.24 mm. long; segment IV rudimentary. Hypostome dentition 3:3.

Female: Unknown.

The species is dedicated to the learned Naturalist, Dr. Carlos de la Torre y Huerta.

[*Note.*—The collection of the Museum of Comparative Zoölogy contains two males of *A. torrei,* taken off *Cyclura macleayi* Gray, in the valley of Luiz Lazo, Prov. Pinar del Rio, Cuba, by Dr. C. de la Torre and Dr. Thomas Barbour. I have compared them with a paratype, kindly sent by Dr. Vigueras, and they agree in every respect.—J. Bequaert.]

NOTES ON A PSYCHID NEW TO NORTH AMERICA (*FUMEA CASTA* PALLAS, Lepidoptera: Psychidæ)

By Donald W. Farquhar[1]
Harvard University

In 1931, workers from the Gipsy Moth Laboratory in Melrose Highlands, Massachusetts, found examples of an unknown case-bearer associated with the introduced beech scale, *Cryptococcus fagi* Bar., near Jamaica Pond, Boston, Massachusetts. Specimens of the case-bearer brought into the laboratory were observed to feed on the eggs and agamic females of the scale, but since this choice of food was decided to be purely incidental and the chief interest of the laboratory was in the scale rather than in the case-bearer, no further work on the latter was done. The writer, however, was interested in the identity of the insect and sent examples of the cases to Dr. Frank Morton Jones of Wilmington, Delaware, who was unable to place them among any of the known North American forms and suggested that an attempt be made to secure adults. In 1932 two male adults were obtained, and in 1933 over 2,000 adults of both sexes were reared from larvæ collected just prior to pupation; this ample material enabled careful study, resulting in the determination of the insect as the European *Fumea casta* Pallas. A discussion of the characters establishing its identity is given in the paper which follows, while the present paper deals with the distribution and biology.

[1]The writer wishes to express his deep appreciation to Frank Morton Jones, specialist in the Psychidæ, who has been most generous in giving of his time and knowledge. A paper which follows, and which bears the name of the writer of the present paper as coauthor, is almost entirely Dr. Jones' own work.

Thanks are also given to Harold Morrison, C. F. W. Muesebeck, A. B. Gahan, and R. A. Cushman, all of the taxonomic unit of the Bureau of Entomology, who examined parasitic material and made determinations where possible.

In the Old World, *Fumea casta* Pall. is widely distributed in England, on the European mainland, in Asia Minor and Algeria. The first specimens discovered in North America were found between Jamaica Pond and the Arnold Arboretum, in Boston, Massachusetts; and subsequent scouting showed this region to be near the center of an area of some 50 square miles (Fig. 1), heavily infested at the center, and

FIG. 1. Map showing regions in Boston and vicinity infested with *Fumea casta* Pall.

gradually diminishing in density toward the edges. Approximately half of the area comprised those sections within the limits of the City of Boston known as Jamaica Plain, Forest Hills, Roslindale, West Roxbury, Hyde Park, Mattapan, the Arnold Arboretum, Stoney Brook Reservation, and Franklin Park; the remaining 25 square miles were in Brookline, Newton Highlands, Dedham, Milton, and the Blue Hills Reservation. A second, and far removed, colony was later found by Dr. Jones in the Morris Arbore-

tum, near Germantown, Pennsylvania; females from this colony readily mated with Massachusetts males; many of the older plantings in the Morris Arboretum are said to have originated in the Arnold Arboretum, which may explain the mode of introduction. A third colony is indicated by empty cases, apparently identical with those of Fumea, found by Dr. W. T. M. Forbes in Bancroft Woods, in Worcester, Massachusetts. Other colonies are to be anticipated.

Larva and Case. The larvæ hatch during June and early July, and at once each individual constructs a small silken case, or "bag," in which, enlarged from time to time, it spends its entire larval and pupal period. This elongate bag is adorned on the outside with bits of grass and other ground debris, longer pieces being attached lengthwise and often projecting slightly beyond the posterior end of the bag. Through an anterior opening, the larva is able to thrust out its head and thorax for purposes of feeding, moving, or working on the case; the posterior end of the case has a smaller opening, usually collapsed but readily opened from within for the expulsion of excrement. During resting and molting periods the anterior edge of the bag is firmly attached by silken threads to some object of support.

Food is taken only during the larval period, and consists chiefly of grasses, mosses, lichens, and other low plants, although the insect may occasionally exhibit carnivorous tendencies, as evidenced by feeding on scale insects and, in the laboratory when very hungry, on the living larvæ and helpless adult females of its own species.

As in many other members of this family, the larval period is very protracted (Fig. 2)—occupying approximately eleven months—and growth is correspondingly slow. From the time of hatching in June or July until the onset of winter, the larval case attains a length of but three millimeters. Hibernation takes place in crevices in the bark of tree trunks, or beneath stones, branches of trees, and other objects resting on the ground. In the spring, feeding is resumed, and growth is more rapid. When the larvæ are mature, in late May and early June, the cases of the females are generally larger than those of the males. Measurements of fifty female cases at this time, inclusive of the loose ma-

terial projecting beyond the end of the case proper, showed a range in length from 8 to 16 mm., with an average of 12.1 mm.; measurements of the same cases, exclusive of the loose material, ranged from 7.5 to 10 mm. with an average of 8.8 mm. Fifty male cases ranged from 7.5 to 13.5 mm., with an average of 10.2 mm., inclusive of the loose material; when measured without the loose material, these male cases ran from 6.5 to 8 mm., with an average length of 7.5 mm.

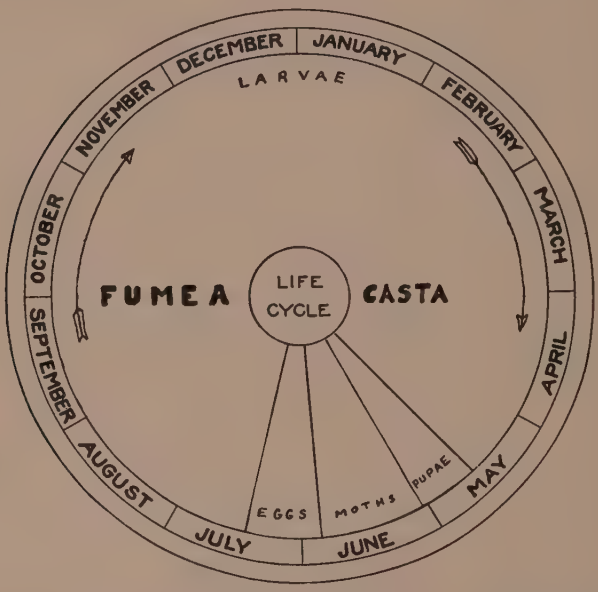


Fig. 2. Life cycle of *Fumea casta* Pall. in Massachusetts.

When the larvæ become full grown, they forsake the ground and low plants on which they have spent their entire lives up to this point, and climb up tree trunks, telegraph poles, fence posts, stone walls, sides of dwellings, etc., to attach their cases for pupation. The height to which the larva ascends before attaching the case varies from a few inches to twenty feet, but few are attached above six feet. Although the larvæ on the ground easily escape notice even in densely populated colonies because of

the close resemblance of their cases to the surroundings, the cases attached for pupation are conspicuous and often render unsightly the objects of attachment.

Pupa. Like the larval period, the pupal period is passed within the bag. After firmly attaching the bag and closing its anterior end in preparation for pupation, the larva reverses its position within the bag so that its head comes to lie at what was previously the bag's posterior opening. Rarely, the larva fails to reverse its position, but in such instances the adult is unable to escape from the bag and perishes within it.

The pupæ of the two sexes are quite different in appearance. That of the male measures from 4.5 to 5 mm. in length, and has the general appearance of orthodox moth pupæ. That of the female measures 5.3 to 7.5 mm. in length, and is noteworthy because of the marked reduction in size of the antennæ, wings, and legs, all of which occupy a very limited area of the anteroinferior portion of the pupa.

In both sexes, when the pupa is ready to yield the imago, it squirms forward in the bag until the head of the pupa projects from the bag's opening; in the male this squirming continues beyond the stopping place in the female, until not only the head projects, but also the thorax and three to five segments of the abdomen. In this position the adult emerges.

The duration of the pupal period is about twelve days in the male, and about seven days in the female.

Adult Male. (Plate 2, figs. C and F.) The male moth is uniformly dark brown in color, and is provided with strong wings to which the scales are loosely attached. The alar expanse varies from 10.5 to 13 mm. (Chapman and Tutt give measurements of 9-15 mm. for European *casta.*) No food is taken by the adult, and the duration of life is but a very few days at most.

Adult Female. (Plate 2, figs. A and B.) In the higher Psychidæ, to which all the North American Psychids belong with the exception of *Solenobia walshella* Clem., the females are maggot-like and devoid of antennæ, eyes, and legs. In the lower or less specialized Psychidæ, the females

are provided with functional legs, antennæ, and eyes. In this latter group belong the native *Solenobia walshella* and the introduced *Fumea casta.* The female is wingless, and the body is practically naked save for a thin scattering of pale hairs and a dense ring of pale, silky hairs at the end of the abdomen surrounding the base of the long, extensible ovipositor. After the female *casta* has feebly squirmed her way out of the pupa-shell, she takes up her waiting posture at the lower end of the bag, still maintaining contact with the interior of the bag by means of her metathoracic legs; often her head, antennæ, and prothoracic legs remain encased in the corresponding parts of the pupa-shell which are broken away from the rest of the shell during emergence. Like the adult male, the adult female takes no food, and her life in this stage is limited to a very few days.

Mating. Immediately after emerging, the female liberates the attractant which summons males within perceiving distance. A male receiving this attractant evidences its perception by becoming suddenly very much excited. He takes flight and follows an erratic course in the direction of the female. Seldom is the sense of perception sufficiently keen to enable a flight direct to the object of search; the usual course is to fly to the general vicinity of the female, then after alighting, with vibrating antennæ and quivering wings, the male continues his quest on foot. His excitement increases in pitch when he attains the bag on which his mate is waiting, and he usually makes several impetuous attempts to clasp nearby objects before making successful contact with the female genitalia. The commencement of copulation is indicated by the male suddenly becoming quiescent, resting with the wings sloped sharply downward (in a "sloping-roof" posture). Seven timed matings indicate a copulation period of six to thirty-eight minutes, with an average of 20.4 minutes. Both sexes may mate more than once, although such successive matings in the female usually occur only when the original mating has been interrupted before completion.

Eggs. As soon as mating is completed, the female probes with her ovipositor to reinsert it in her empty pupa-shell, which lies within the bag; in this process of probing she is

assisted by the metathoracic legs, the tibia and tarsus of which are still within her bag, and probably facilitate the reinsertion of the ovipositor by acting as a guide. The eggs are pale in color and very delicate, and are deposited by means of the extremely manœuverable, telescopic ovipositor, which, when fully extended, equals the length of the remainder of the female's body. When the last of her 150-odd eggs have been deposited, the female withdraws her ovipositor, closing the opening to her egg-filled pupa-shell with a plug of fuzz from the tip of her abdomen; she then relinquishes her hold on the bag, and drops to the ground to die. The eggs hatch in thirteen to fifteen days, the young larvæ leaving the parental bag via its open end.

Dispersal. Since the adult female is incapable of flight or other locomotion, the dispersal of the species depends on the wanderings of the larvæ, and especially their transportation by other agencies. Just as human beings have unwittingly brought this insect to America, so, too, its dispersal within America is probably greatly assisted by man's conveyances. Another factor in the dispersal is the wind; as soon as the newly hatched larvæ have constructed their tiny cases, they have the habit of dropping themselves down on a silken thread, in which condition they are easily picked up by wind currents to be dropped perhaps at some distance away. Since evidence indicates a sojourn of the insect in this country of at least two decades, with these various factors aiding in its distribution, the insect probably will soon be found in many, and possibly widely separated localities.

Parthenogenesis and Preponderance of One Sex. Although parthenogenesis has been recorded in the genus Fumea in Europe—and, indeed, has been reported in *Fumea casta* (Fauna Boica II, 91, Schrank)—no evidence of this phenomenon has been observed in Massachusetts *casta*. Fifteen unmated females from the Boston colony were isolated in an experiment designed to detect evidences of parthenogenesis. All died without ovipositing, within five days after emergence.

In both Europe and America, authors have remarked upon the occasional striking preponderance of one sex over

the other in Psychid rearings. In parthenogenetic species, females are either the only form known or greatly outnumber the males. In America, Dr. Jones has mentioned (Tr. Am. Ent. Soc., LIII, 310, 1927) a collection of thirty-odd cases of *Eurukuttarus edwardsi* Heyl. of which only one was female; the same author (Ent. News, XXXIII, 130. 1922) bred some forty males without a single female from a collection of *Psyche celibata* Jones. Returning to *Fumea casta*, a similar numerical ration between the sexes was found in many of the Massachusetts collections, as shown in the following table based on adults bred from cases collected at time of pupation; where cases failed to yield adults, they were opened and the sex determined from the enclosed pupæ; in those few cases where the larvæ died, accurate sex determination was not considered possible, and such individuals are ignored in the tabulation:

TABLE 1.—Sex ratio in certain collections of *Fumea casta* in Massachusetts.

Date of collection	Place of collection	Number of individuals	% ♂ ♂	% ♀ ♀
May 6, '33	Arnold Arboretum	7	100	000
May 6, '33	Stoney Brook	70	100	000
May 12, '33	Stoney Brook	69	100	000
May 13, '33	Arnold Arboretum	100	100	000
May 22, '33	Arnold Arboretum	130	100	000
May 22, '33	Fenway	25	100	000
May 22, '33	Jamaica Pond	100	93	7
June 5, '33	Jamaica Pond	375	34	66

Interpretation of the above table is complicated by the fact that the Jamaica Pond colony was some two weeks behind the other colonies in reaching maturity; in fact, for a time the larvæ of this colony were considered as possibly of another species because of their smaller size. Therefore, the high percentage of females in the latest collection does not necessarily mean that similar results would have obtained if later collections had been made at the other sites. It appears from the table that the earliest larvæ to pupate are the males, which conforms with the condition in many other Lepidoptera. The striking preponderance of males

Farquhar—*Fumea casta*

may be due to some peculiar habit of the female in choosing different or more concealed places for pupation than the males, thus rendering their cases less liable to detection by the collector.

Parasites. Apparently *Fumea casta* has become established in America without its European parasites. Although the writer reared over 2,000 adult moths from cases collected at the time of attachment, only eleven parasites emerged from the material, and probably all eleven of these emerged from a single host. They proved to be a new species and genus of Eulophidæ related to *Elachertus,* as yet undescribed. Several hundred cases collected in Massachusetts were sent to Dr. Jones, and from them he reared eleven specimens of *Dibrachys boucheanus* (Ratz.) [A. B. Gahan]. Dr. Jones also reared two specimens of *Itoplectis conquisitor* (Say) [R. A. Cushman] from cases collected in the Morris Arboretum in Pennsylvania.

In addition to these definite instances of parasitism, two species were found in the field associated with *Fumea casta*: A female of *Ephialtes equalis* (Prov.) [R. A. Cushman] was taken in the field with its ovipositor thrust through a bag attempting to oviposit in the contained pupa. A specimen of *Eunotus lividus* Ash. [A. B. Gahan] was found in a tube in which cases of *casta* were being collected, and probably gained entrance to the tube by being on or within one of the cases when it was collected.

Explanation of Plate 2.

Fig. A.—Adult females on their bags (x2).

Fig. B.—Adult females (x2).

Fig. C.—Adult males (x2½).

Fig. D.—Bags from which adult males have emerged leaving their empty pupa-shells protruding from the bags (x2½).

Fig. E.—Bags attached for pupation on a stone wall in a heavy infestation (⅓ natural size).

Fig. F.—Adult males (x3½).

THE IDENTITY OF AN INTRODUCED PSYCHID, *FUMEA CASTA* PALLAS (Lepidoptera, Psychidæ)

By Frank Morton Jones and Donald W. Farquhar

When in 1931 the larvae and larval cases of this small Psychid were first observed in the Boston area in Mass., it was apparent that the insect could not be identified with any known North American species of the family. A very few adult males were secured in 1932, and these sufficed to refer the insect to the European genus *Fumea,* hitherto unrecognized in the western hemisphere, and to indicate that we were dealing with an introduced species. Abundant material of both sexes, bred in 1933, confirmed the generic reference and permitted a careful comparison with exotic material and the literature of the genus. Since the insect has already extended its range in two States and is destined to take permanent place in our fauna, it seems advisable, in addition to the biological notes included in the preceding paper, to put on record those details of its structure which should suffice for its ready recognition in this country.

Fumea, in much of its extensive European literature, obviously has been made to include species structurally divergent, and even under identical specific names there has been such lack of agreement that mixed series or mistaken identities seem the only explanation. We have profited by the careful work of Chapman, of Tutt, and of Burrows, and have accepted their identifications of *casta* Pallas, the most abundant and widely distributed species of the genus, as the basis of our comparisons. That some of the characters we describe and illustrate should be generic rather than specific, is necessitated by the confusion of literature we have indicated. In addition to the general habitus of the insect, we have found useful for comparison the following characters:

Venation, wings of male (Plate 3, fig. 1).—This Psychid is an 11-7 veined insect. In both wings the media divides

the cell and does not fork within the cell. On the fore wing the 1st anal does not reach the margin and the 2nd and 3rd anals, coincident from near the base, extend to the margin without fork or branch; some variation exists in the origin of the two lower radials, which may arise from a point at the end of the cell, may be closely stemmed to the end, or may be separated at their origin on the cell.

The hind wing has three anal veins, the 2nd sometimes tending toward union with the 1st by extending a slight angulation and trace of a spur; the radius and humerus are not joined beyond the base. M may arise as in the figure, or as a direct continuation of the media.

This is all in accord with Fumea nitida as illustrated by Chapman, but not in agreement with Brauer and Perris (which have media of fore wings forked within the cell), indeed under *Fumea* by Seitz.

Legs of male (Plate 3, fig. 5).—In Fumea and its allies the length of the anterior tibial spur (the epiphysis) has been extensively used in the separation of genera and species. Chapman's measurements thus used and quoted, though designated as spur ratio, really relate to the ratio of the length of the tibia beyond the origin of the spur to the whole length of the tibia. For Fumea (including perhaps Solenobia) Chapman gives this ratio as .77-.81. This range is evidently too narrow, for Perrons who inherited Chapman's collection and added to it measured 250 Fumea (including Chapman's series) and found a ratio range of .72 to .81. Evidently the method of preparation and measurement as well as individual variation affect the ratio application of this character.

Eleven mounts of the legs of Massachusetts Fumea give us an average ratio of .76, with a minimum and maximum of .72 and .79.

Legs of female (Plate 3, fig. 6).—These agree with male in having five joints to the tarsi of all legs. A single terminal apical spur is sometimes present on the fore tibia, rarely present on the mid-tibia, may be present on one tibia, absent from the corresponding opposite tibia of the same insect. When present it varies in shape from almost globular to elongate with a length twice its diameter. These

conditions prevail in both English and American examples.

In both sexes, irregularity exists in the relative length of the legs (the third pair always the longest), due chiefly to the variability of the first tarsal joint.

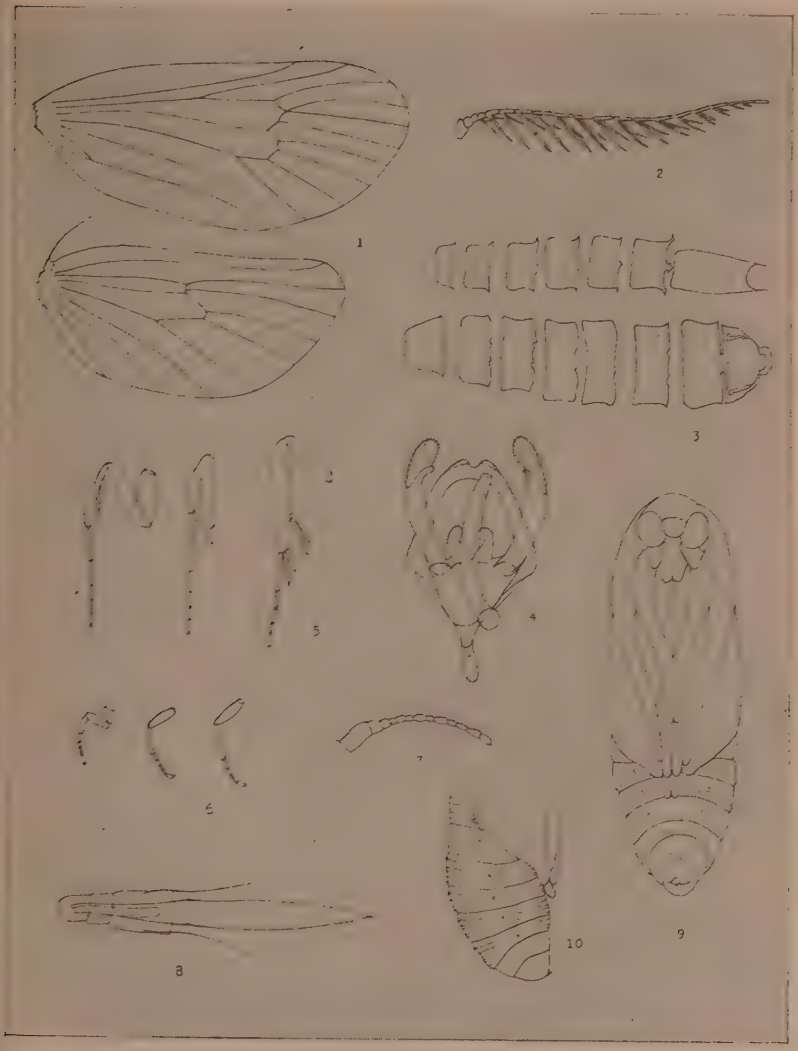
Antenna of the male (Plate 3, fig. 2).—Bipectinate from the third or fourth joint. The third joint, sometimes showing a short pectination, is usually more or less fused with the fourth; and the distal joint may be simple or bipectinate, according to its degree of fusion with the next. The longest pectination (balsam mount) measures .52 mm. The shaft and dorsum of the pectinations are clothed in appressed scales (these and the fine hairs of the pectinations not shown in the figure). The apparent number of antennal joints is usually 20, but these by fusion may be reduced to 18 or 19, and in one instance we were able to count 21 joints.

Antenna of female (Plate 3, fig. 7).—Simple, bead-like, consisting of 13 joints of irregular size. Occasionally 14 joints may be detected.

Abdominal plates and genitalia of male (Plate 3, figs. 3 and 4).—By direct comparison we detect no essential differences in these structures, between our Massachusetts insects and *casta* as identified by English entomologists.

Ovipositor of female (Plate 3, fig. 8).—The ovipositor is capable of extrusion until it equals the entire length of the remainder of the insect. Balsam mounts of the female abdomen show prominently three sets (of 2 each) of hair-like black rods, which function in the telescopic mechanism. Mounts from English *casta* show these rods to be identical in number, shape, and position with those of Massachusetts insects; and this apparent identity extends to *relative* length of the three sets, with such exactness that specific identity of the insects seems assured. Preparations by identical technique, drawn and measured at the same magnification, for the three sets of rods give these ratios of length:

5 English *casta*, from the Chapman and Burrows collections	36 : 48 : 147
3 Massachusetts *casta*	36 : 50 : 147



Some Structures of an Introduced Psychid
(*Fumea casta*, Pallas)

1. Venation of male (10x)
2. Antenna of male (12x)
3. Abdominal plates of male (12x)
4. Genitalia of male (37x)
5. Legs of male (10x)
6. Legs of female (10x)
7. Antenna of female (27x)
8. Rods of ovipositor (10x)
9. Male pupa, ventral view (11x)
10. Male pupa, lateral view (11x)

Pupa of male (Plate 3, figs. 9 and 10).—In the male pupa of *Fumea,* the fore wings, the legs, and the antennæ are free at their apices, standing out slightly from the abdomen, so that according to the degree of its extension they may overlap the fifth abdominal segment or may barely reach its anterior margin. As far as we have been able to make comparison, the general characters of the pupa as shown by our illustration are in accord with English *casta.*

We are aware that the form of the generic name (Tutt, British Lepidoptera, II, 317, 318, 1900), its genotype, and the properly included species, are all subjects for differences of opinion and will require review, and that in the European literature the status of *casta* Pallas, with reference to its synonyms, its geographical races, and the number of possibly distinct but closely related species remains a matter of opinion. Tutt follows Chapman in treating *intermediella* Bruand as a race intergrading with *casta,* while Seitz considers *intermediella* a pure synonym. By Tutt's analysis, in this "protean species represented by various local races," our insect in size and structure comes nearest to variety *intermediella,* which is supposed to be of more frequent occurrence on the European mainland rather than in England. In view of the impossibility of determining the place-origin of our insect and of the intergradation of the partially localized and illy-defined varieties or races of *casta,* we believe that for the present this recent addition to our fauna may be most satisfactorily designated in our literature by the oldest and best-known name for this widely-distributed insect, *Fumea casta* Pallas.

SPIDER BITE BY OLIGOCTENUS (Fam. CTENIDÆ)

By L. F. Pinkus,
High School, St. Louis, Missouri

During June, 1929, a student brought into the laboratory a spider which has been identified by Prof. A. Petrunkevitch as a new species of Oligoctenus of the family Ctenidæ. According to Comstock the members of this family wander about in search of their prey and are active mainly at night. Some of the tropical species are very large. They make no webs for a dwelling, but some species appear to inhabit burrows in the ground.

My specimen was taken from a bunch of bananas, so its real origin could not be determined. It was placed in a rather large insectarium, of which the bottom was filled with earth. The spider was very inactive most of the time and hid in the corners of the container.

After about two weeks it was brought home because of the close of school. A visitor, noticing the cage, inquired what might be seen there and in order to show off my trophy I opened the cage and pushed the spider with the index finger of my left hand, in order to induce him to move about. Instantly I was bitten.

Here are my notes concerning the effects of this bite:

June 12, 1929:—4.30 P. M.—Bitten by spider (Oligoctenus) on index finger of left hand. Index finger swelled. The instant piercing pain was quite severe. After approximately ten minutes the swelling had covered the whole finger. The finger was numb, but painful with a prickly crampy sensation, interrupted by throbbing, jerky pains. A little dizziness accompanied this, and after fifteen minutes, for just a few seconds, became quite severe, and perspiration collected on my forehead. My lips became blue for a short while and the pain continued intense for about an hour. After two hours the swelling extended over a larger area of the hand, covering the index finger and the greater part of the back of the hand and reaching all the way over to the metacarpals of the third finger; in other words, leaving free only the metacarpal and phalangeal region of thumb

and little finger. By this time the intensity of the pain had diminished, there was no discoloration, while the temperature of the swollen area rose to some extent. At this time the prickling pain was accompanied by a slight burning sensation in the region of the greatest swelling, which had enlarged the knuckle of the index finger to twice its original diameter. During all this time I was unable to bend the first three fingers of my left hand.

June 13, 1929—6.30 A. M.—On awakening, I found that the swelling had subsided considerably, but the numb feeling still extended over the same area. The pain was the same prickly sensation as when a limb has "fallen asleep," as the popular saying is.

4.30 P. M.—Swelling entirely disappeared. No pain.

For scientific records pertaining to spider bites and their effects one should recall the admirable and heroic experiments of Dr. Baerg and his experiences with the Tarantula and Black Widow.

I offer this record as an addition to the few scattered records pertaining to spider bites. No medical attention was administered, and the only treatment given was to place the hand in warm water, which somewhat relieved the pain.

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NEW LYCOSIDÆ FROM FLORIDA

By Elizabeth B. Bryant

Museum of Comparative Zoölogy, Harvard University

Through the kindness of Mr. H. K. Wallace of the University of Florida, I have had the opportunity to examine a collection of spiders made by him. Among them are three species that are new. The types are deposited in the Museum of Comparative Zoölogy collection.

Lycosa carrana sp. nov. (Fig. 1)

♂ 10.5 mm. long, ceph. 5.6 mm., abd. 5.5 mm.

1 leg, 16. mm., IV 21. mm.

Cephalothorax light yellow, the black about eyes is continued from p.l.e. as two parallel stripes of dark hairs to posterior margin, median light stripe wider than dark stripes, a narrow marginal dark stripe, a narrow line of white hairs between p.m.e. which does not extend to margin of clypeus; abdomen with a wide median dark stripe on posterior half which is continued as two converging lines forward to near the anterior margin, a stripe of white hairs each side of median stripe bordered by a dark gray stripe, the median dark stripe on the posterior half is the most conspicuous marking on the abdomen; sternum light with a cloudy gray center; venter almost covered by a sharply defined black spot, near the middle of which, three pairs of white muscle spots are distinctly seen, black before the epigastric fold; legs light yellow without marks, but I metatarsus and tarsus much darker; spines, I tibia, 2-2-2, 1 lateral which appears almost as ventral, metatarsus 2-2, 1 median apical; eyes, anterior row straight by the upper margins, shorter than second eye row, a.m.e. larger than a.l.e. and separated by less than half a diameter, almost touching a.l.e., p.m.e. separated by more than half a diameter, p.l.e. separated by almost three diameters; palpus, patella and tibia of about equal length, tarsus little longer than tibia, palpal organ as figured.

Holotype ♂ Florida, Big Pine Key, 20 December, 1933, A. F. Carr, coll.

This species has the narrow line of white hairs between the median eyes as in *Lycosa helluo*, but the light stripe is very much broader and the dark stripes narrower and the black spot on the venter is never found in the former species. It is named for the collector, Mr. A. F. Carr.

Arctosa incerta sp. nov. (Figs. 2 and 3.)

♂ 4. mm., ceph. 2. mm., abd. 2. mm.

Cephalothorax rather flat, reddish brown, sides veined with black, tegument glabrous with a very few black hairs,

FIGS. 1-4. 1, *Lycosa carrana* sp. nov., palpus; 2, *Arctosa incerta* sp. nov., palpus; 3, *Arctosa incerta* sp. nov., epigynum; 4, *Schizocosa floridana* sp. nov., palpus.

a bright yellow triangle with apex at dorsal groove gradually darkening towards eyes, eyes surrounded by black, a bright stripe from dorsal groove to posterior margin, a very narrow black marginal line; abdomen reddish brown sparsely covered with long black hairs, a pair of irregular black marks at base with bright yellow between, usual spear mark very faint, margined with black dots, many

small black spots closer together about middle, sides thickly covered with dark spots; sternum pale, darker about margin, venter heavily spotted with black; labium higher than wide; coxæ light; legs covered with black hairs, femora with three interrupted dark rings, tibiæ darker, spines, I spine on III or IV tibia above; eyes, anterior row shorter than second row, slightly procurved, equidistant, a.m.e. larger than a.l.e., p.m.e. less than diameter apart, quadrangle of posterior eyes almost square; palpus, femur longer than patella and tibia, patella and tibia about equal length, tarsus once and a half as long as tibia; palpal organ as figured.

♀ 4.1 mm. long, ceph. 2. mm., abd. 2.4 mm.

Markings the same as in male but brighter and the basal marks at base of abdomen not as large; spines and eyes the same as in male; epigynum with the usual median septum and terminal transverse piece as figured.

Holotype ♂ Florida; St. Petersburg, 8, April, 1933, H. K. Wallace, coll.

Allotype ♀ Florida.

The generic position of this species seems uncertain. Following the generic key given by F. O. P. Cambridge in the Biologia Centrali-Americana, it would be placed in the genu *Arctosa* because it lacks a spine at the base of the III and IV tibia. The male palpus is very similar, but it is very much smaller than others in the genus. The quadrangle of posterior eyes is almost square, a character usually found in *Pardosa,* but the cephalothorax is very low so it could not be placed in that genus and the palpus is very unlike that of other species. In all specimens seen the yellow spot in front of the dorsal groove is very conspicuous.

Schizocosa floridana sp. nov. (Fig. 4.)

♂ 4.5 mm. long, ceph. 2.4 mm., abd. 2.2 mm.

Cephalothorax with a wide median yellow stripe with irregular margins which extends beyond the third row of eyes, bordered by a dark brown stripe veined with black, a supramarginal light stripe, black about the eyes; abdomen with usual basal spear mark rather indistinct, followed by

dark chevrons, a pair of dark spots at base with a bright yellow area between, sides spotted; sternum yellow, venter spotted with black; legs yellow with three poorly defined dark rings on femora, I tibia and metatarsus darker, with few long hairs but no brush as in *Schizocosa ocreata;* eyes, anterior row straight, shorter than second row, a.m.e. larger, separated by half a diameter and almost touching a.l.e., p.m.e. separated by less than a diameter; quadrangle of posterior eyes slightly wider behind; clypeus black, as high as diameter of a.m.e., palpus patella and tibia of about equal length, tibia only slightly swollen, about as wide as long; palpal organ similar to *Schizocosa ocreata* but anterior horn longer and more slender, central tenaculum not bidentate.

Holotype ♂ Florida, Gainesville, 31, March, 1933. H. K. Wallace, coll. No. 134D.

This species differs from *Schizocosa ocreata* by the smaller size, lack of brush of hairs on the first tibia and the differences in the palpal organ.

GROWTH AND DETERMINATE SIZE IN INSECTS

By Charles T. Brues.

In common with nearly all metabolic activities, growth is essentially a determinate process, and size since it is the ultimate result or end product of growth, is inherently determinate also. To speak of the determinate size of an individual animal is therefore only to restate a self evident fact, and he who attempts to expound upon its truth may be accused of considerable naiveté. During the recent cycle of biological investigation much attention has been given to the phenomena of growth, especially by physiologists, geneticists and statistical biologists. These workers have defined in mathematical terms certain of the more evident features of growth both in individual organisms and in populations, but I believe that it remains for some one more deeply interested in another phase of biology, namely taxonomy, to consider size as in a sense a static phenomenon in spite of the fact that it is clearly a measure of growth. This is particularly appropriate in dealing with insects, since in them the growth process is ordinarily very rapid, ceasing abruptly and not gradually slowing down. Such observations are necessarily less precise than the data just mentioned, but they serve to demonstrate the existence of a deep-seated and stable genetic constitution which determines size and the growth process by which it is attained in individual animals. Size as we shall consider it, results from the interaction of a series of excitatory and inhibitory stimuli during the development of an individual whereby its growth follows quite closely a definite and predictable course, terminating when adult size is attained. Such termination is particularly definite in the case of insects where almost without exception the imaginal or reproductive stage marks sharply the attainment of final size and form.

This determinate and definitive size involves certain gross characteristics, irrespective of the multiplicity of factors which have produced it, that are patent to any student of taxonomy. Those to which I shall refer to-day relate to comparative imaginal size in insects, although, since absolute size is directly dependent upon rate and time of growth, these cannot be eliminated completely from any discussion of size.

We usually speak of insects as small animals, but there exist great variations in size in practically every extensive taxonomic group. We find that some beetles, for example, are in bulk several million times as large as other beetles, if we compare the largest Scarabæoidea with certain minute Ptiliidæ. Many less striking differences appear in other orders and I have been tempted to draw upon an admittedly scattered knowledge of insects in general to illustrate certain size peculiarities in various groups.

Insects are by no means an exception among extensive groups of animals by reason of their great variation in size, as very similar or greater diversity may be pointed out in other classes of animals, as the Crustacea, fishes or mammals, or in the Phylum Mollusca, if we compare certain minute gastropods with giant squids. In all animals size shows a marked correlation with taxonomic groupings, *i. e.*, size must be regarded as having an inherently stable genetic basis which is its primary determinant. Secondarily it is modified with reference to food or climate, but such modifications do not show any great constancy, regularity or extent. Thus in the tropics the size of certain types of insects is increased, for example, many scarabæoid beetles are represented there by species much larger than those in cooler regions, and the same is true in some other groups. On the other hand the reverse obtains among other types, although it must be admitted that tropical climates on the whole favor larger size in insects if we compare members of the same group and especially species in single families. Among marine invertebrates large size is very often associated with cold waters, but a reverse condition occurs in some groups. The largest living terrestrial mammals are tropical, yet in some families the species are decidedly larger in

cold climates. Among reptiles the largest forms are very clearly those of the tropics. Without multiplying examples further it is evident that neither warm nor cold climates can be regarded as constant stimuli to large size among animals in general. Thus certain types appear to wax larger in one to which they are usually said to be best adapted. The accuracy of such a conclusion is certainly open to question, as it is based on the dubious assumption that increased size is indicative of a more perfect adaptation to the environment.

I shall hope to be pardoned for introducing the foregoing long series of commonplace statements, but it appears necessary to have them in mind before going any further.

In general, the average size of insects has probably decreased during the history of the group on the earth, at least during its early history, but these changes have been very slight compared with the great increases in size that occurred, for example, very early in the history of the mammalia, in certain special groups of mammals, and among the mesozoic reptiles during their period of ascendency. Among these mammals and reptiles this great increase in size has consistently led to the extinction of the groups in which it occurred. Since some primitive types of living insects are of very small size, we may reasonably believe that such small forms were more abundant during the early history of insects than actual paleontological discoveries have yet been able to show. We know in some cases like that of the early giant dragon-flies that comparatively large size still persists as a general characteristic of recent Odonata. The same is true generally in other groups like the Blattariæ, Orthoptera, Mantodea and Corrodentia which tend to adhere rather closely to the size-range which prevailed among their ancient prototypes. Thus conservatism in size appears to be a characteristic of insect groups over long periods of time. The failure of any insects to attain a size comparable to that of certain giant Crustacea is usually attributed to their aërial habitat which renders their soft bodies highly susceptible to gravitational and traumatic deformation at the time of molting. This is certainly not the entire story, however, as there are no un-

usually large aquatic insects, and the body-shape of large insects is not that which would lessen gravitational stresses. We must certainly admit that there is some good reason, probably dependent in great part upon the insect's respiratory and circulatory systems, which acts still more strongly to keep its body-size below certain limits. However, as the vast majority of insects do not tend to approach these limits, such factors are obviously not important ones in regulating size as between minute, small or moderate-sized forms. We may expect to find correlations between the size of the egg or its contained embryo and the size of the imaginal insect, and it would be totally unexpected if definite correlations were not to be found. It is surprising to note, however, that such a correlation is by no means universal. Many rather large insects, like meloid beetles, produce a large number of small or minute eggs, and a survey of such cases reveals quite universally some type of development which exposes the early stages to great vicissitudes of life. On the other hand some small or minute insects produce comparatively very large eggs or young, such as certain phorid flies and aphids, and the pupiparous Diptera. There are also very striking examples to be found among the parasitic tachinid flies where closely similar forms produce either many small, or a few large eggs, respectively, irrespective of the size of the parent flies. In all such cases differences in size at birth are not correlated with imaginal size, and represent highly adaptive modifications with reference to post-embryonic growth which have not in the least affected imaginal size.

Since the primary requirement for growth is food we may expect to find size in insects dependent at least to some degree upon abundance or type of food. Vegetarian diet furnishes a much more constant and plentiful source of food materials than that available for forms that depend upon animal foods, but larger amounts are necessary to supply equal energy. It is very evident in groups where both types of food habits occur that the vegetarian forms are more numerous in individuals, but do not develop to greater size. This is well illustrated by the very populous colonies of those ants which subsist on plant food in comparison with

carnivorous species where the colony is consistently smaller. Here individual size does not respond to abundant food supply, but instead an increase in the number of individuals or in the size of the colony occurs. This condition appears to be repeated very generally in other, non-social, groups of insects, although increase in numbers is not so patent in the case of non-gregarious species. It must be said, however, that the bulkiest of all insects like the goliath beetles, hercules beetles, certain phasmids, saltatorial Orthoptera, giant silk-worms and the like are vegetarian, although the dragon-flies, tarantula-killer wasps and mantids of carniverous habits attain exceptionally large size. Also, the largest insects which, so far as we know, ever existed were predatory dragon-flies. It may be said as a rule that the smallest insects as well are vegetarian, saprophagous or microphagous although there are many minute entomophagous parasites. Predatory or carnivorous forms are neither abundantly represented among the smallest forms of insect life, nor are they conspicuously numerous among the largest.

Abnormalities in size among certain individuals may occur through a gross insufficiency of food during growth. Certain of the larger muscoid flies that develop in fermenting or decaying materials may vary considerably in size, frequently producing some greatly dwarfed individuals where their food supply has failed before larval growth was completed. Such specimens develop completely except for size. The partly grown larvæ of certain dermestid beetles may even decrease in size when starved and again grow to produce normally sized individuals when food is restored. Such abnormalities do not of course apply to our present discussion.

Certainly no generalizations concerning size in insects can be derived from the conflicting mass of details which present themselves when we attempt to correlate size with any of the foregoing trophic, developmental or environmental differences. Nevertheless, the size range in a great many taxonomic groups is very restricted; in others size varies widely, and occasionally giant forms appear singly or sporadically in groups otherwise very homogeneous in

respect to size. Speaking in very general terms, several orders of insects include consistently small or minute species, for example the Protura, Collembola, Thysanoptera, Zoraptera, Mallophaga, Anoplura, Siphonaptera, Strepsiptera and Corrodentia, the last group being less appropriately cited as it includes a few moderate-sized species. Other orders include entirely or in great part large species, such as the Phasmatodea, Mantodea, Orthoptera, Blattariæ, Odonata and Megaloptera. It is noticeable in the latter series that small forms do occur here and there in practically all of the orders cited as there are a few very small Blattariæ and Orthoptera; moreover some Mantodea and Odonata are by no means large insects. In some orders size is extremely variable, for example in the Hemiptera, Neuroptera, Trichoptera, Lepidoptera, Diptera, Hymenoptera and Coleoptera. By far the majority of insects are included in these seven orders of which the last four are far and away the most extensive.

Several matters relating to size stand out very clearly from the rough approximations just outlined. Extensive groups composed of large species produce occasionally or sporadically small or dwarf types. Thus it appears that a reduction in size has been accomplished far more easily during the course of evolution in insects than has the reverse change whereby small types have given rise to large ones. The most extensive orders where speciation has been most active and where the appearance of diverse types has proceeded at a rapid rate, exhibit the widest range in size. It follows therefore that size and form show a strong tendency to remain constant or to vary together, not to be modified independently of one another. This is strong evidence that size has a strongly fixed genetic basis since it does not readily change, except in groups where morphological diversification and adaptation has been most extensive.

Even in these orders the fixity of size is well illustrated if we compare the subdivisions such as superfamilies or families. Among the Hymenoptera, for example, certain superfamilies show great constancy in size. The superfamilies Serphoidea, Chalcidoidea, and Cynipoidea include only small or minute species, with really only a single com-

paratively "giant" generic type (Pelecinus, Leptofœnus and Ibalia, respectively) in each superfamily. This is true notwithstanding the fact that certain of the minute parasitic forms have developed the most unexpected method of development, known as germinogony, whereby a single egg produces enough larvæ to consume a large caterpillar. Here numbers replace size in exploiting the trophic field. On the other hand in the same order Hymenoptera other superfamilies do not show such constant size. The Tenthredinoidea, Ichneumonoidea, Vespoidea and Formicoidea include moderate-sized species with numerous small and scattered large types, showing that a wide variation in size in this extensive order is characteristic only of certain groups. The largest known Hymenoptera are Jurassic Siricoidea, a superfamily whose living representatives are still characteristically large insects with a few small, derived types.

Another very extensive order, the Lepidoptera, show more or less similar conditions with reference to size. This group was at one time rather crudely divided into "Microlepidoptera" and "Macrolepidoptera." The former group is really composed almost entirely of one superfamily, the Tineoidea with a slight admixture of more primitive forms (Micropterygoidea) that are really quite closely similar to certain much larger ones (Hepialoidea) near which they are now placed. The more rational taxonomic grouping of these primitive types into two superfamilies corresponds closely to the size of the included types.

With these facts in mind we must discard at once any supposition that relates body size in insects to fortuitous circumstances or to adaptations readily acquired in relation to a changing or specialized type of environment. Size appears as a highly stable character, deeply imbedded in the genetic constitution of at least most groups of insects.

OBITUARY

ARGYLE B. PROPER, an associate member of the American Association of Economic Entomologists, died at his home in Wakefield, Mass., on December 16, 1933, after being ill about a week with pneumonia. Mr. Proper was born in Sunapee, N. H., on March 4, 1905. He received a B. S. degree from the University of New Hampshire in 1926 and a M. S. degree from the same institution the following year, having majored in entomology. On July 1, 1927, he was appointed a Junior Entomologist in the U. S. Bureau of Entomology for work at the Bureau's laboratory at Melrose Highlands, Mass., with which station he was connected up to the time of his death.

Although Mr. Proper had published but one entomological article, another manuscript had been accepted for publication, and he was to have presented a paper at the Boston, Mass., 1933, meeting of the Entomological Society of America. At the time of his death he was preparing two other manuscripts. These and the papers he had completed had to do directly or indirectly with forest and shade tree insects. Collecting insects in the White Mountains interested him and he spent much of his vacation time on hiking trips in that region.

Mr. Proper was a member of the Cambridge Entomological Club, at the meetings of which he was a regular attendant.

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